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ABSTRACT

Fricatives and affricates in different word positions and initial fricative clusters were elicited from three linguistically deviant children (ages five years, two months to seven years) and one normal child (age two years, nine months) by means of pictures depicting familiar objects. Data from two of the older children and the normal child are analyzed in this note. The deviant children seem to be following a normal progression of fricative development when compared to normative studies, but they are learning much more slowly. The phonetic data on the initial fricative clusters is published in full and compared with cluster reduction processes from the literature on normal children. Again, the delayed children display processes similar to normal children. In addition, it is hypothesized that s + stop clusters are the last produced as clusters, while s + nasal clusters, and clusters containing fricatives other than s are produced as clusters sooner by both normal and deviant children. (Author)

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A NOTE ON THE PRODUCTION OF FRICATIVES IN LINGUISTICALLY DEVIANT CHILDREN

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INTRODUCTION

This note presents a preliminary report on the production of fricatives, both singly and in clusters, by three linguistically deviant children. Fricatives were chosen for study because of the difficulty children have in acquiring them. Both normative studies (e.g., Templin 1957, Snow 1963, Olmsted 1971) and diary studies of individual children (c.f., summary in Moskowitz 1970) have repeatedly confirmed their late acquisition date. Consequently they are among the most frequently mispronounced consonants (c.f., Winitz 1969).

METHOD

Subjects. The subjects were three children who were enrolled in classes at the Institute for Childhood Aphasia, Stanford University, at the time of the study. Each had a language deficit that could not be explained by emotional or intellectual factors. Their selection was based on noticeable articulatory difficulties combined with a sufficiently advanced linguistic system to allow participation in naming activities. In addition, one normal child was used to test the elicitation materials and to provide comparison. More normal children were not included because of an extensive study of the acquisition of fricatives by normal children already in progress by the Stanford Child Phonology Project (NSF Grant GS-30962, Aspects of the Acquisition of English and Spanish Phonology).

Table 1

Initial, Sex, and Age of Four Children Observed

	Subject	Sex	Age
Normal	K	Female	2;9
Deviant	J	Male	6;5
Deviant	M	Male	7;1
Deviant	T	Female	5;2

Materials. Speech sounds were elicited by the use of specially constructed picture books depicting familiar objects whose names contain the target sounds. Table 2 shows the fricatives studied and the words containing them. (See Table 2 on next page). It is obvious that this list is somewhat incomplete. No effort was made to test all possible medial environments (intervocalic, postconsonantal, etc.) and non-final members of final consonant clusters are treated simply as medial (e.g., s in desk). For some sounds, there are far too few words for the results to give a complete picture. The limitation of /ʒ/ to the word television was a practical one--it was the only word with a medial /ʒ/ which I thought children would be sure to know. No final /ʒ/'s were used because they are either commonly replaced by /dʒ/ in American English (as in garage) or they occur in words probably not known to children (beige, mirage). Similar practical reasons can be given for the other small samples with the exception of /dʒ/, a serious oversight. The only other omissions of occurring English sounds are /-č/ and /-dʒ-/. The consonant clusters collected are given in Table 3. They all contain fricatives and they are all word initial clusters.

Table 2

Fricatives and Affricates Occurring in Initial, Medial, and and Final Position

Sound	Initial	Medial	Final
f	feather face finger feet fish fat funny father	laughing breakfast elephant	laugh knife leaf scarf
v	vacuum	t.v. television shaving	glove stove
θ	thin	bathroom	mouth teeth
ð	that the (etc.)	feather mother father	(none)
s	cereal sock saw	desk breakfast castle glasses mixer	horse face dress juice glass socks
z	zipper	lazy present	eyes glasses flowers dresses buzz
ʃ	shoes shaving	washing machine brushing	fish brush
ʒ	------	television	(none)
h	hat hair hammer	---------	-------
tʃ	cheese children	teacher	watch
dʒ	juice	(none)	orange

Table 3

Fricative Consonant Clusters

Sound	Words	Sound	Words
fl-	flowers fly	sp-	spoon spider
fr-	frying fruit frog	st-	star stove stocking
θr-	throw three	sk-	school
		sw-	sweeping
sm-	smoke smile	sl-	sleeping
		skr-	screw
sn-	snow snail	str-	string
ʃr-	shrimp	skw-	squirrel

Procedure. The picture books were first shown to the normal child in one fairly long session with several breaks. The children at the Aphasia Institute required three shorter elicitation periods of about ten minutes length. Sessions were recorded and later transcribed with the facilities of the Stanford Child Language Project. In addition to the target words, any words containing fricatives in the child's spontaneous speech during the session was also transcribed and included in the analysis.

An effort was made to have the child say each word spontaneously--without the experimenter saying the word first. Very often, however, this was not possible and many of the words were elicited as imitations. Imitations, although separated during the transcription, were included as data for analysis.

RESULTS

The data from two of the linguistically deviant children have undergone a preliminary analysis which is reported here, along with that of the normal.

Fricatives. Two important questions confront data from linguistically deviant children. The first one concerns the order of acquisition of speech sounds. Is control of language sounds or phones achieved in a normal order by linguistically deviant children? The second question is directed toward the very common phonological rules found in normal children learning various languages, such as those discussed in Ingram (1971). Do these same rules occur in the language systems of deviant children, or are there different rules which are not normally found?

Regarding the first of these questions, Templin (1957, 51) gives a listing of fricatives and affricates according to the age at which 75% of children tested said them correctly. Of the sounds which Templin says 75% of 4 year olds can say, K has control over 90.9%, J over 72.7% and M over 81.8%. At the 6 year level, the percentages are K - 86.4%, J - 59%, M - 50%, and at the 7 year level, K - 77.7%, J - 55.5%, and M - 44.4%. (See Table 4).

Table 4

Acquisition of Fricatives and Affricates by Three Linguistically Deviant Children

Age Acquired (according to Templin)	Speech Sound	Subjects K	J	M
3;0	f-	+	+	+
	-f-	+	+	+
	-f	+	+	(+)
	h	+	+	+
3;6	-s-	+	+	0
	-z-	+	0	(+)
4;0	s-	+	+	+
	ʃ-	+	0	(+)
	-ʃ	+	0	(+)
	-v-	+	+	+
	dʒ-	0	+	0
4;6	-s	+	+	0
	-ʃ-	+	0	0
	tʃ-	+	(+)	+
	-tʃ-	+	0	0
	-tʃ	+	+	0
6;0	θ	+	0	0
	-θ-	(+)	+	0
	-θ	(+)	0	0
	v-	0	0	0
	-v	+	+	+
	ð-	0	0	0
7;0	-ð-	0	(+)	0
	z-	+	0	0
	-z	0	0	0
	-ʒ-	+	0	+
	-d	0	(+)	0

KEY

+ = 66% or more correct
(+)= 50-66% correct
0 = less than 50% correct

From this chart, it can be seen that K, J, and M seem to be following a normal path in the acquisition of surface sounds. It is important to realize that Templin's ordering cannot be construed as a Guttman scale of implication ordering, i.e., that one cannot acquire the sounds she lists at age 6 until one has control of those at 4;6. Templin simply lists ages at which 75% of children control certain sounds. There is nothing to say that the 75% at 4;6 will remain the same 75% at 6 or even that the 75% for one sound at a given age are the same as for another sound at the same age. There may be many alternative paths taken by individual children which could still give Templin's statistics. Thus, K, who seems to control sounds controlled by Templin's children at age 6 still does not control one 4 year old sound, /dʒ-/. Similarly, J and M have control of some later phones while their general level would have to be that of 75% of children at around age 4-4;6.

A further indication of the normality of J and M's phone acquisition order is gained by looking at substitutions. A listing of substitutions made for each phone (irrespective of the particular word it occurs in) can be found in Snow (1963) and Olmsted (1971). The substitutions of all 3 children were compared to these published lists, and 68 out of 70 of their substitutions were listed. The two exceptions were really one. Both J and M once substituted /dʒ/ for /tʃ/ although such a substitution was not listed.

The general impression is, however, that M and J have normal surface phonologies, although they are much behind their chronological age. More exacting analysis may be possible given the forthcoming fricative study from the Child Phonology Project. For instance, that study may find that for the children they followed, one fricative invariably emerged before another (e.g., /ʃ-/ before /tʃ-/). Given a more fine-grained analysis, it may be possible to specify in detail certain ways in which language-delayed children differ from normal children.

The second question, concerning processes, cannot be answered at this time. It will require much more analysis which is currently underway.

Consonant Clusters. Table 5 presents the raw data from these three children. (See next page). Possibly unfamiliar symbols in the transcriptions are the following: ɬ = lateral fricative, = = strongly articulated, ɫ = dark l, ̝ = wet fricative, ̟ = weakly articulated, r = standard American r, ̩ = syllabic consonant, ɑ = low mid unround vowel; ɚ is used even in stressed syllables. Discussion of these examples is somewhat hindered by the incomplete analysis of the fricative data. For example, the /θ/ /t/ process in J's /θr/ cluster is probably the same process which turns all of his simple /θ/'s to /t/'s. The same may be said for the /θ/ → /f/ process in M's /θr/ cluster.

Ingram (1971) describes a general rule of Cluster Reduction with three more specific components. Clusters of s+C, and most clearly with s+Stop C are reduced by dropping the /s/. Clusters involving a liquid and a stop are reduced by dropping the liquid. Final clusters of nasal + voiceless stop are reduced by dropping the nasal, while final clusters of nasal + voiced stop are reduced by dropping the stop.

Table 5

Production of Words With Consonant Clusters by Three Linguistically Deviant Children

Initial Clusters		K	J	M
fl	fly(s)	f:laɪs	fwaɪ	fɬaɪ
	flowers	fˀlaʊʷɹs	flaʊɹs	ˀpluwɹkʰ
fr	fry(ing)	fraɪˈn	fwaɪˈn	f:waɪɪn
	fruit	fˀrutʰ	fˀrutʰ	fˈu:, fu·
	frog	fˈra:g	fˈɔg	fʷwaʊ
θr	throw	f·row	tʰrowɪn	fwow
	three	θəri	tɹi	fˀri
sm	smoke	smokʰ	moksˈ	smo:ʷ
	smile	smaɪlɪŋ	naɪjə	sáɪŋl
			maɪˌˈ^n	smáɪˈˈˈɬ
sn	snow	sˈnoʷ	1. hjõw 2. s:õ 3. no	sˈno·ʷ
	snail	nejɹl	ᵉneo	s:mɪl
sp	spoon	bunᵗ	pʰun	pʰum
	spider	pᵝaɪdɹ	pʰaɪdɡ	pᵝaɪdɹ
st	star	s:taɹ	tʰaɹ	dar
	stove	stov, s:toʊ	tʰoʊ	tʰoʊ
	stocking	stakins	tʰakɪŋ	----
sk	school	ˢkoᵉ	gʰu:	guɔt
sw	sweep(ing)	sˈwipin	tʰɹpɪn swepɪn	sʷiphᵗ
	*sweater	s:weʃɹ		
sl	slippers	ɬ:pɹs	sˈlɪpɛ	ɬɛdor
	sleeping	slipin	ʃˈˈepʰɪn	hɬi
	*slide	sˈaɪd		
skr	screw	skʳu	gʰᵛᵊ	gᵊruo:
skw	squirrel	s:kʷɹ::t	gwʒᵘh	growo
str	string	--------	tɹ eŋ	ʰtri:n
ʃr	shrimp	f:ʃr:mpʰ	sˈw:mpʰ	ʃrɪnˈ

* Forms taken from spontaneous speech.

Of the clusters in this study, /sp/, /st/, and /sk/ fit these rules most obviously. As predicted by the Cluster Reduction rule, J and M simplify all such clusters by dropping /s/. K, however, seems to be developing the ability to retain the /s/ as well as the stop in /st/ and /sk/, although /sp/ remains a simple stop. The triple cluster /skr/ and /str/ behave in the same way, although there seems to be a distinct tendency to retain the liquid even though dropping the stop. As expected K retains /s/ as well as the liquid in /skr/. /skw/, although it does not have a liquid, seems to act in the same way.

/sn/ and /sm/ are not explicitly covered by Ingram's rule and they do act somewhat differently from s+stop. There is a tendency for all three children to retain some friction at the beginning of words containing these clusters as well as retaining the nasal, although in two or three cases only the nasal is produced. Note that the nasal is retained even though /s/ is voiceless. J's production of smoke is the most interesting, in that the s seems to have migrated to the end of the word. Similar cases have been observed sporadically in other children.

Similarly, /sw/ and /sl/ are not covered by the rule. Both again favor retention of friction as well as the second consonant, although /sl/ also favors the production of a lateral fricative in two of the children. / r/ is also regularly produced with fricative and liquid or glide. K's production may indicate some uncertainty about the word which is probably not a common one in the 2 1/2 year old's vocabulary.

/fr/ is the most consistent across all children. /f/ is invariably produced, and most of the time an /r/ or /w/ follow. The major exception is M's production of fruit as /f·u:/. Notice that it is quite normal for M to leave off the final consonant. This, with the fact that many /f/'s are followed by sounds more u-like than w-like (J's frog, M's frog) may lead us to the conclusion that /fu/ is the closest M can come to /fwu/ which may not even be a permissable English sequence.

/fl/ is again rather consistent in retaining both friction and following consonant. /θr/ is more complicated as noted above. Even though the initial consonant changes (θ → t, f) are predictable by general rule, it is interesting to note the stability of the following r--it is never deleted.

It seems, then, at first glance, that several consonant clusters containing fricatives other than s are "easier" than s+stop, and that s+nasal is also "easier". Furthermore, liquid deletion seems to be suppressed earlier than s-deletion. In fact, the last clusters to be pronounced correctly are those beginning with s+stop. Further study of fricative consonant clusters may lead to a better understanding of the intricacies of Cluster Reduction.

As a final note, it should be added that the fact that J and M's cluster articulations have been useful in examining the Cluster Reduction rule gives further indication of the normal but slow nature of their language development.

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